Translation

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Form PCT/IPEA/416
02569P10WO		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP2004/000035	07.01.2004	22.01.2003
International Patent Classification (IPC) or national classification and IPC		
F01L 13/00		
Applicant		
THYSSENKRUPP AUTOMOTIVE AG		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 8 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☐ *(sent to the applicant and to the International Bureau)* a total of _____ sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))
      _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:
   - ☒ Box No. I Basis of the report
   - ☐ Box No. II Priority
   - ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - ☐ Box No. IV Lack of unity of invention
   - ☒ Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - ☐ Box No. VI Certain documents cited
   - ☐ Box No. VII Certain defects in the international application
   - ☐ Box No. VIII Certain observations on the international application

Date of submission of the demand	Date of completion of this report
Name and mailing address of the IPEA/	Authorized officer
Facsimile No.	Telephone No.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2004/000035

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

☐ international search (Rule 12.3 and 23.1(b))

☐ publication of the international application (Rule 12.4)

☐ international preliminary examination (Rule 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1-9 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☒ the claims:

nos. 1-10 as originally filed/furnished

nos.* _____ as amended (together with any statement) under Article 19

nos.* _____ received by this Authority on _____

nos.* _____ received by this Authority on _____

☒ the drawings:

sheets 1/1 as originally filed/furnished

sheets* _____ received by this Authority on _____

sheets* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____

☐ the claims, nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/EP2004/000035

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	5, 8	YES
	Claims	1-4, 6, 7, 9, 10	NO
Inventive step (IS)	Claims		YES
	Claims	1-10	NO
Industrial applicability (IA)	Claims	1-10	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

D1: JP-A-06 017623

D2: EP-A-1 255 027

D3: DE-A-196 29 349

D4: DE-A-196 45 112

D5: DE-A-28 10 784

D6: DE-A-15 26 488

D7: DE-A-43 13 656

1. The term "reversal point" as applied to a cam surface can refer to a point on the cam surface at which a reversal takes place. This reversal can correspond to the maximum throw, and hence for each of the pivot cams in documents D1, D2 and D3 it is necessarily given by the point at which the pivot motion reverses. The reversal can be linked to the radius or concavity of the cam surface at this point ("reversal point 29" in document D4, column 4, lines 16 to 20) or to the valve opening speed associated with the point ("reversal point 18" in document D5, page 8, lines 4 to 10) or to the valve acceleration ("reversal point WP" in document D6, figures 1 to 4 and column 1, lines 8 to 19). Claim 1 in the present application provides no further details to clarify the meaning of the term "reversal point".

With the rising flank of a cam, the opening speed of the valve increases up to a point on the flank at which the opening speed starts to decrease (acceleration = 0), and this point is a reversal point (see D5, page 8, lines 4 to 10, and figures 2 and 3, "reversal point 18"; also D6, figure 1, "reversal point WP"). A similar point must exist on cam surface 12a of cam 12 in D1 (see also D1, figure 2; the speed curve is shown as a dashed line, with the reversal corresponding to a point on the rising flank 12a and also on cam surface 6 of intermediate element 4 in D2 and on cam surface 80.2 in D3.

Documents D1, D2 and D3 appear to disclose all the features set out in the preamble of claim 1. The "other cam joint" referred to in claim 1 is represented by intermediate element 12 and output element 52 in D1 (figure 24), by cam surface 6 of lifting lever 4 and roller 7 of output element 1 in D2, and by cam surface 80.2 of pivot element 78 and roller 82 of output element 84 in D3.

If the term "reversal point" refers to a change in the concavity of the outer surface of the cam in the valve lift portion, then there is no such point in either D1 or D2. However, there are two in D3 (see dotted line 80.2 in figure 3), one at the interface between the circular portion 80.1 and the central surface portion (arrow R1), and the other at the approximate mid-point of the rising flank.

The application fails to meet the requirements of PCT

Article 33(1) because the subject matter of claim 1 is not novel (PCT Article 33(2)).

2. It is known from document D4 to provide a concave portion and thus a reversal point (reference sign 29 in figure 4 of D4) on the rising flank of a cam surface at the point of contact with a roller (specifically a small roller) of a cam follower (see D4, column 1, lines 26 to 42). The application of this teaching to the corresponding contact surface between the intermediate element and the output element in D1, D2 or D3 is an obvious measure because it would allow a person skilled in the art to obtain the advantages of the concave portion known from D4 in a device according to D1, D2 or D3.

D5 also provides a teaching whereby the cam surface has a more gentle curvature in the portion of maximum throw than in the arc 12 of the first maximum throw 19. Point 19 corresponds to a reversal in the cam surface radius because the radius at the rising flank increases continuously until point 19, after which there is a reduction in the radius. For a person skilled in the art it is obvious that this teaching can be applied to the portion of maximum throw in D1, D2 or D3 to ensure improved contact between the cam and the cam follower (see D5, page 5, second paragraph, page 7, last paragraph).

The application fails to meet the requirements of PCT Article 33(1) because the subject matter of claim 1 does not involve an inventive step (PCT Article 33(3)).

3. Claims 2 to 9

Claim 2

In D1, D2 and D3 the position and orientation of the intermediate element are adjustable.

Claim 3

In D1, D2 and D3 there is only one reversal point as per D5 or D6 on the rising flank of the cam surface (point of maximum speed or zero acceleration). In D4 only the second reversal point 29 (figure 4, right-hand side) is in the valve lift portion because the first reversal point 29 (figure 4, left-hand side) appears to be below the circumference 27 with zero lift.

Claim 4

Because of the symmetry, the point of maximum rise speed on the cam surface is also the point of maximum descent speed (see also D6, figure 1), and this point corresponds essentially to the starting and finishing valve lift.

Claim 5

See D5, figures 2 and 3, reference signs 9, 13 and 20.

Claim 6

See D2 and D3, rollers 7 and 82 respectively.

Claim 7

See D1, figure 24, cam joint 12/52; D2, figure 1a, cam joint 4/1; D3, figure 1, cam joint 78/82.

Claim 8

See D7, figure 1.

Claim 9

See D3, intermediate element 74 and transmission element 78.

The application fails to meet the requirements of PCT Article 33(1) because the subject matter of claims 2 to 9 is not novel (PCT Article 33(2)) and does not involve an inventive step (PCT Article 33(3)).

4. Claim 10

Document D7 discloses a device for actuating gas exchange valves 21 in a piston engine, consisting of a housing 20; a cam 23 rotatably mounted in a pivot joint 22 in the housing, the rotary movement of the cam being derived from a crankshaft; an intermediate element 24 actuated by the cam via a first cam joint 32/33; and an output element 25 which transmits the motion to the valve 21 and is operatively connected to the intermediate element either directly or via other transmission elements, with at least one other cam joint 27/30 or 39.1/40 (figure 4) provided within the operative connection between the first cam joint and the output element, said other cam joint 39.1/40 being formed at one of the two gear elements 39 that make up the actual cam joint by a cam surface 39.1, the shape of which in the contact portion in which the transition from the portion in which no valve lift is

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

produced and the portion in which valve lift is produced is defined by a section and an involute portion (claim 4) (as specified, the shape of the cam surface 39.1 is also in the contact portion between zero lift and valve lift, as per the wording of claim 10).

The application fails to meet the requirements of PCT Article 33(1) because the subject matter of claim 10 is not novel (PCT Article 33(2)).